REMARKS

A.   Request for Reconsideration

Applicant has carefully considered the matters raised by the Examiner in the outstanding Office Action but remains of the position that patentable subject matter is present. Applicant respectfully requests reconsideration of the Examiner's position based on the enclosed Declaration, the amendments to the claims and the following remarks.

B.   The Invention

The present invention is directed to thermally developable light-sensitive materials and image forming methods using the materials.

In one of the novel aspects of the invention, the light-sensitive material contains a first reducing agent represented by Formula (A-1), a second reducing agent represented by Formula (A-3) and a compound represented by Formula (A-4). In another novel aspect of the invention, a coefficient of determination R^2 of the regression line is from 0.998 to 1.000.

C.   Status of the Claims

Claims 1-12 and 14-20 are presented for further prosecution.

Claims 1, 4, 7 and 10 have been amended to recite that the light-sensitive material includes a reducing agent of Formula (A-3). Support for this amendment can be found on page 22, par. 4 to page 28, par. 2.

D. <u>Rejections under 35 USC § 112, first paragraph</u>

Claims 1-12 and 14-20 had been rejected as failing to comply with the written description requirement. The Examiner had stated that the specification fails to provide a clear description of how to obtain the regression line, how to calculate the coefficient of determination R^2, and how to calculate the gradient.

Applicant submits that those in the art are familiar with regression lines, the calculation of R^2 and the calculation of the gradient. In any event, par. 4 on page 10 of the application explains that the regression line is obtained by plotting the points of u* and v* or a* and b* at various photographic densities of the image on a graph of CIE 1976 (L* u* v*) color space or CIE 1976 (L* a* b*) color space in which the abscissa is u* or a* and the ordinate is v* or b*. Figure 2 of the application is an example of such a plot. After the data points are plotted, the regression line is defined as a straight line which passes through the plotted data points. The regression line satisfies the equation y=a+bx.

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The enclosed summary sheet explains the R^2 measurement method. As explained on page 1 and illustrated in the plot on page 1 of the summary sheet, the regression line y=a+bx is an approximation of the plotted data (x_i, y_i) obtained by the CIE 1976 method. The mathematical equations AAA through KKK on pages 2-6 of the summary sheet are used to calculate the coefficient of determination R^2. As shown in the three plots on page 6 of the summary sheet, the plotted data points (x_i, y_i) substantially mirror the regression line when R^2 approaches 1, while the plotted data points do not mirror the regression line when R^2 approaches 0. The coefficient of determination R^2 is measured in this manner.

The gradient is the slope of the regression line y=a+bx as defined in standard textbooks.

Applicant respectfully submits that the specification complies with the requirements of § 112.

E.   Rejections under 35 USC § 103(a)

Claims 1-12 and 14-20 had been rejected as being unpatentable over either Nishijima '101 (EP 1278101), Nishijima '649 (US 6,699,649) or PS '266 (GB 1543266) in view of Yoshioka (US 6,413,712). The Examiner had taken the position that the addition of the reducing agent of Yoshioka to the materials of either Nishijima '101, Nishijima '649 or PS '266 produces a

material that inherently has the claimed coefficient of determination R^2.

Claims 1-12 and 14-20 had been rejected as being unpatentable over Oya (US 6,376,166) in view of Yoshioka. The Examiner had taken the position that the addition of the reducing agent of Yoshioka to the material of Oya produces a material that inherently has the claimed coefficient of determination R^2.

Applicant traverses these rejections for the following reasons.

1. <u>The amended claims recite a reducing agent of Formula (A-3) in combination with a reducing agent of Formula (A-1) and a compound of Formula (A-4)</u>

Nishijima '101, Nishijima '649, PS '266 and Oya had been cited to teach a reducing agent of Formula (A-1) of the present invention (see Formula (S) on page 3 of Nishijima '101, Formula (S) in col. 2 of Nishijima '649, Formula (I) on page 15 of PS '266, and Formula (1) in col. 2 of Oya). Yoshioka had been cited to teach a compound of Formula (A-4) of the present invention (see Formula (II) in col. 2 of Yoshioka). The Examiner had stated that it would be obvious to add the compound of Yoshioka to Nishijima '101, Nishijima '649, PS '266 and Oya.

Applicants have amended claims 1, 4, 7 and 10 to recite that the light-sensitive material contains a reducing agent of Formula (A-3). The cited references do not teach or suggest a reducing agent of Formula (A-3) in combination with a reducing agent of Formula (A-1) and a compound of Formula (A-4). Applicant therefore respectfully submits that the present invention is patentable over the cited references.

2. A superior image is produced and the claimed coefficient of
    determination R^2 is satisfied when a reducing agent of
    Formula (A-3) is added to a light-sensitive material having
    a reducing agent of Formula (A-1) and a compound of Formula
    (A-4)

Applicant directs the Examiner's attention to Table 1 on page 208 of the application. Sample 1 contains reducing agent 1-18 on page 31 of the application which falls within the scope of Formula (A-1). Sample 2 contains reducing agent 1-6 on page 30 which falls within the scope of Formula (A-3), and compound 2-6 on page 46 which falls within the scope of Formula (A-4). Sample 4 contains reducing agent 1-18 and compound 2-6. Thus, Sample 1 does not contain a reducing agent of Formula (A-3) or a compound of Formula (A-4), Sample 2 does not contain a reducing agent of Formula (A-1), and Sample 4 does not contain a reducing agent of Formula (A-3). Table 1 shows that the R^2 values for

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Samples 1, 2 and 4 were outside the claimed range. In addition, Table 1 shows that the anatomical and physical evaluation results for Samples 1, 2 and 4 were between 76-83.

In contrast to Samples 1, 2 and 4, Samples 5-11 in Tables 1-3 on pages 208-210 contain a reducing agent of Formula (A-1), a reducing agent of Formula (A-3) and a compound of Formula (A-4). Tables 1-3 show that Samples 5-11 satisfied the claimed R^2 range. In addition, Tables 1-3 show that Samples 5-11 received evaluation results between of 87-92 which are higher than the evaluation results obtained for Samples 1, 2 and 4.

Tables 1-3 therefore demonstrate that a superior image is produced and the claimed coefficient of determination R^2 is satisfied when a reducing agent of Formula (A-3) is added to a light-sensitive material having a reducing agent of Formula (A-1) and a compound of Formula (A-4).

3.   The Declaration of Mr. Yanagisawa demonstrates that a superior image is produced and the claimed coefficient of determination R^2 is satisfied when the light-sensitive material has a reducing agent of Formula (A-1), a reducing agent of Formula (A-3), and a compound of Formula (A-4)

Mr. Yanagisawa prepared light-sensitive material Samples A through F as described in the enclosed Declaration. Sample A was prepared in accordance with Sample 110 of Nishijima '649

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having developing agent 1-24 which falls within the scope of Formula (A-1) of the invention. Sample B was prepared similar to Sample A, except that a portion of developing agent 1-24 was replaced by developing agent 1-3 of Nishijima '649 which falls within the scope of Formula (A-3). In addition, compound (II-3) of Yoshioka falling within the scope of Formula (A-4) was added. Sample C was prepared similar to Sample A, except that developing agent 1-24 was replaced by developing agent (f) of PS '266 which falls within the scope of Formula (A-1). Sample D was prepared similar to Sample C, except a portion of developing agent (f) was replaced by developing agent 1-3 of Nishijima '649 which falls within the scope of Formula (A-3). In addition, compound (II-3) of Yoshioka falling within the scope of Formula (A-4) was added. Sample E was prepared in accordance with Sample 201 of Oya, except that phenol compound I-1 was replaced by phenol compound E which falls within the scope of Formula (A-1) and is illustrated in the attachment to the Declaration. Sample F was prepared similar to Sample E, except that a portion of phenol compound E was replaced by developing agent 1-3 of Nishijima '649 which falls within the scope of Formula (A-3). In addition, compound (II-3) of Yoshioka falling within the scope of Formula (A-4) was added.

Samples A, C and E of the Declaration are representative of the teachings of Nishijima '101, Nishijima '649, PS '266 and Oya since Samples A, C and E did not have a reducing agent of Formula (A-3) or a compound of (A-4). Samples B, D and F are representative of the claimed invention since Samples B, D and F have a reducing agent of Formula (A-1), a reducing agent of Formula (A-3), and a compound of Formula (A-4).

Mr. Yanagisawa anatomically and physically evaluated the images produced using Samples A-F and determined R^2 as described in par. 9 of the Declaration. As shown in the Table attached to the Declaration, Samples B, D and F prepared in accordance with the present invention satisfied the claimed R^2 limitation and received anatomical and physical evaluations results from 90-92. In contrast, Samples A, C and E outside the scope of the claimed invention did not satisfy the claimed R^2 limitation and received lower evaluation results from 74-79.

Thus, by comparing Sample B, D and F with Samples A, C and E of the Declaration, it can be seen that a superior image is produced and the claimed coefficient of determination R^2 is satisfied when the light-sensitive material has a reducing agent of Formula (A-1), a reducing agent of Formula (A-3), and a compound of Formula (A-4). Mr. Yanagisawa declared in par. 11 of the Declaration that these results are surprising and unexpected because the cited references do not teach or suggest

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that an improved image is produced when a reducing agent of Formula (A-3) and a compound of Formula (A-4) are added to a light-sensitive material having a reducing agent of Formula (A-1). Also, Mr. Yanagisawa declared that the results are surprising and unexpected because the cited references do not teach or suggest the criticality of the claimed coefficient of determination R^2.

Applicant therefore respectfully submits that the present invention is patentable over the cited references taken alone or in combination.

F.   Conclusion

In view of the foregoing and the enclosed, it is respectfully submitted that the application is in condition for allowance and such action is respectfully requested. Should any extensions of time or fees be necessary in order to maintain this Application in pending condition, appropriate requests are

hereby made and authorization is given to debit Account # 02-
2275.

                              Respectfully submitted,

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Encl: R^2 measurement summary sheet (6 pages)
      Executed Declaration of Mr. Hiroyuki Yanagisawa
      Return receipt postcard

Coefficient of Determination (Goodness-of-Fit Measure)

Now, let it be assumed that data (x_i, y_i) of a certain sample can be approximated by means of a regression line $y = a + bx$. An actual observed value (x_i, y_i) does not always agree with this approximation line naturally, and it is general that a deviation (an error) e_i from a predicted value $(x_i, \hat{y}_i)$ is generated. Namely,
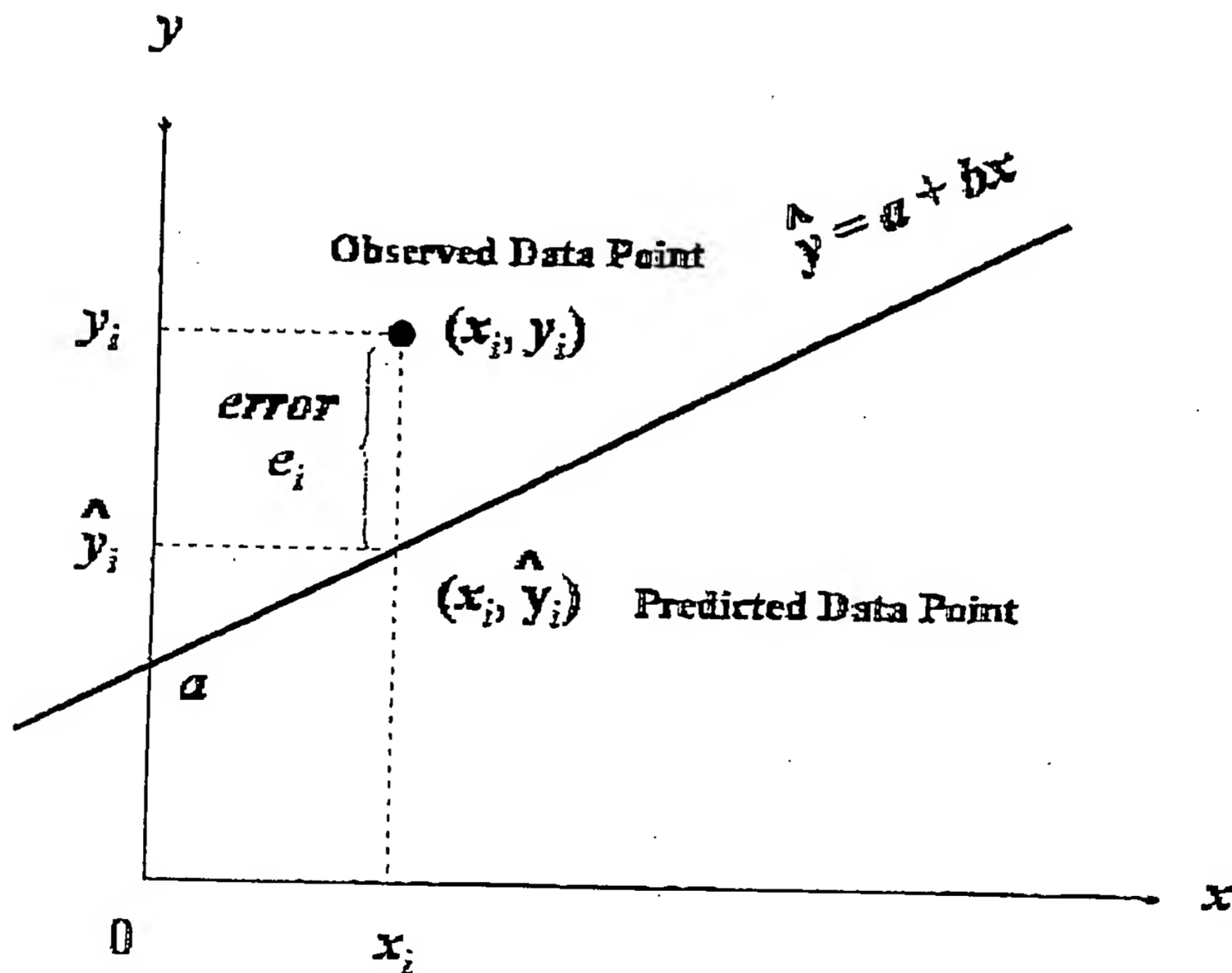
there is a relationship of **AAA** between a observed value (y_i)

of a variable y and a predicted value ($\hat{y}_i$).

AAA:

$$e_i = y_i - \hat{y}_i = y_i - a - bx_i$$

In an opposite

way, a straight line which can be drawn under the condition

for minimizing the sum of squares of this error is a

regression line y = a + bx of the sample. In other words, it

is a straight line that minimizes **BBB**.

BBB:

$$S_E = \sum_{i=1}^{n} e_i^2 = \sum_{i=1}^{n} (y_i - \hat{y}_i)^2 = \sum_{i=1}^{n} (y_i - a - bx_i)^2$$

The condition for minimizing S_E is **CCC**, and parameters

a and b for determining the regression line are shown by **DDD**.

CCC:

$$\frac{\partial S_E}{\partial a} = \sum_{i=1}^{n} 2(y_i - a - bx_i)(-1) = -2\sum_{i=1}^{n}(y_i - a - bx_i) = 0$$

$$\frac{\partial S_E}{\partial b} = \sum_{i=1}^{n} 2(y_i - a - bx_i)(-x_i) = -2\sum_{i=1}^{n}(y_i - a - bx_i)x_i = 0$$

DDD:

$$a = \overline{y} - b\overline{x}$$

$$b = \frac{\sum_{i=1}^{n} x_i y_i - n\overline{x}\,\overline{y}}{\sum_{i=1}^{n} x_i^2 - n\overline{x}^2} = \frac{\sum_{i=1}^{n}(x_i - \overline{x})(y_i - \overline{y})}{\sum_{i=1}^{n}(x_i - \overline{x})^2}$$

On the other hand, the sum of squared deviations (the total sum of squared deviations) S_T obtained by subtracting a sample average ($\overline{y}$) from observed value (y_i) is shown by **EEE**

EEE:

$$S_T = \sum_{i=1}^{n}(y_i - \overline{y})^2$$

in which the sum of squared deviations which can be explained by the regression line $y = a + bx$ is called sum of squared deviations S_R that is expressed by **FFF**. In contrast to this,

FFF:

$$S_R = b\sum_{i=1}^{n}(x_i - \overline{x})(y_i - \overline{y})$$

other errors which cannot be explained by the regression line are called residuals, and its sum of squared residuals S_E is shown by **GGG**, and aforesaid three sums of squared deviations **GGG**:

$$S_E = \sum_{i-1}^{n} e_i^{\,2} = \sum_{i-1}^{n} (y_i - \hat{y}_i)^2$$

have a relationship of **HHH**.

HHH:

$$S_T = S_R + S_E$$

Incidentally, as a standard to determine how sample data (x_i , y_i) agree with the regression line y = a + bx, there is one called "coefficient of determination" r^2 and its value is sometimes called Goodness-of-Fit. This corresponds to the sum of squared deviations which can be explained by the regression occupying the total sum of squared deviations, as shown in III. Square root r of this Coefficient of

III:

$$r^2 = \frac{S_R}{S_T} = b\left\{\frac{\sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y})}{\sum_{i=1}^{n}(y_i-\bar{y})^2}\right\} = \left\{\frac{\sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y})}{\sum_{i=1}^{n}(x_i-\bar{x})^2}\right\}\left\{\frac{\sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y})}{\sum_{i=1}^{n}(y_i-\bar{y})^2}\right\}$$

$$= \frac{\left\{\sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y})\right\}^2}{\sum_{i=1}^{n}(x_i-\bar{x})^2 \sum_{i=1}^{n}(y_i-\bar{y})^2} = \frac{\left(\sum_{i=1}^{n}x_iy_i - n\bar{x}\bar{y}\right)^2}{\sum_{i=1}^{n}(x_i^2 - n\bar{x}^2)\sum_{i=1}^{n}(y_i^2 - n\bar{y}^2)}$$

Determination r^2 is shown in **JJJ** which is called a correlation coefficient, and this is used as a standard for Goodness-of-Fit by a certain person.

JJJ:

$$r = \frac{\sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i-\bar{x})^2 \sum_{i=1}^{n}(y_i-\bar{y})^2}} = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{\sigma_{xy}}{\sqrt{\sigma_x\sigma_y}}$$

ただし、$S_{xy} = \sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y})$

$$S_{xx} = \sum_{i=1}^{n}(x_i-\bar{x})^2$$

$$S_{yy} = \sum_{i=1}^{n}(y_i-\bar{y})^2$$

$$\sigma_{xy} = S_{xy}/(n-1)$$

$$\sigma_x = S_{xx}/(n-1)$$

$$\sigma_y = S_{yy}/(n-1)$$

However, in the case of obtaining correlation coefficient r,

when the correlation coefficient is calculated from the

coefficient of determination r^2, the correlation coefficient

is defined as in KKK when regression coefficient

(inclination) b of the regression line is negative.

KKK:

$$r = -\sqrt{r^2}$$

In the case of r = ±1, all of sample data points (x_i, y_i)

agree with the regression line y = a + bx, while, in the case

of r = 0, they turn out to be uncorrelated.